Chapter 9 Homework

1. $m(t) = 10 \cos [100 t – 8 \sin (20t)]$, $k_f = 5$

$\beta = 8 = \Delta f/f_m = \Delta\omega/\omega_m = \Delta\omega/20$: $\Delta\omega = 160 = E_m k_f = 5E_m$: $E_m = 160/5 = 32$

2. Same as 1.

3. $m(t) = 25 \cos [200 t – 2 \sin (20t)]$, $k_f = 10$: $\beta = 2$, $\omega_m = 20$

$B = 2(\Delta f + f_m)$ (Carson's rule); therefore, $B = 2f_m (\Delta f/f_m + 1) = 2f_m (\beta + 1)$

$B_\omega = 2\omega_m (\beta + 1) = 2(40)(2 + 1) = 240$ rad/sec

4. Same as 3

5. $P = A^2/2 = E_c^2/2R = 0.5$ W

6. $\beta = 4$, $P = (0.4E_c)^2/2R + 2 (0.07E_c)^2/2R + 2 (0.36E_c)^2/2R + 2 (0.43E_c)^2/2R + 2 (0.28E_c)^2/2R + 2 (0.13E_c)^2/2R + 2 (0.05E_c)^2/2R + 2 (0.02E_c)^2/2R$

$= E_c^2/2R[(0.4)^2 + 2 (0.07)^2 + 2 (0.36)^2 + 2 (0.43)^2 + 2 (0.28)^2 + 2 (0.13)^2 + 2 (0.05)^2 + 2 (0.02)^2 = E_c^2/2R (0.9952) = 0.4976$ W

7. $E_c^2/2R$, same

8. 2 – one from phone to base, and one from base to phone

Tx: 824 - 835, 845 - 846.5 or 835 - 845, 846.5 - 849 MHz
Rx: 869 - 880, 890 - 891.5 or 880 - 890, 891.5 - 894 MHz

B = 30 kHz

9. 832/6 - 21 = 117